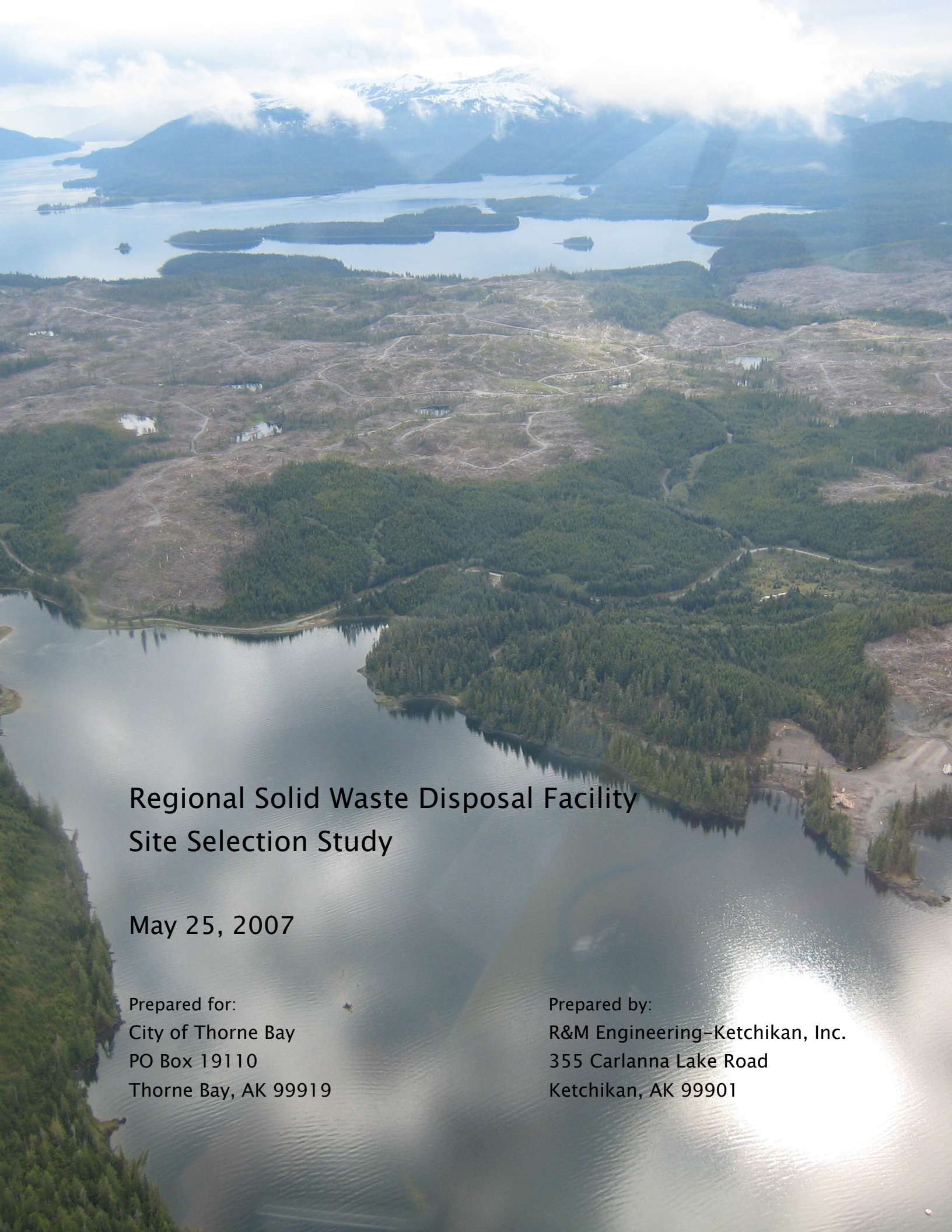

Regional Solid Waste Disposal Facility
Site Selection Study

May 25, 2007

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1. Introduction

The City of Thorne Bay is pursuing an interest in developing a regional solid waste processing, treatment and disposal facility that would serve all of Southeast Alaska. The need for such a facility has been raised and studied in recent years as a result of changing regulations and rising costs involved in operating many small facilities throughout Southeast Alaska. Many small towns and villages find it difficult to operate a solid waste disposal facility and many of the larger towns have found it to be more cost effective to ship solid waste to large regional landfills in the Lower 48 states.

The City of Thorne Bay has two areas available for selection within or just outside its municipal boundaries. One is a portion of Sections 13 and 24 of Township 72 South, Range 84 East, Copper River Meridian, owned by the Alaska Mental Health Trust Land Office, which we will call Site 1, for purposes of this report. The second area is a portion of Section 25 of the same township, owned by the State of Alaska, Department of Natural Resources, which we will call Site 2, for purposes of this report. The sites are approximately 320 acres and 50 acres in size, respectively. The two sites are shown in Figure 1 in the Appendices. This study will evaluate those sites based on numerous criteria and will identify the 50-acre portion of each site that would be best suited for such a facility. Selection criteria will include physical attributes such as ground slopes and elevations, proximity to streams and other surface waters, soils conditions and access considerations. Permitting issues such as wetlands, anadromous fish streams and land use zoning will also be studied. Development issues, access, topography, life expectancy, operational considerations and costs and final closure will be some of the other criteria.

2. Regional Solid Waste Disposal Alternatives Study

The Southeast Conference, an association of Southeast Alaska communities, initiated a study of solid waste disposal alternatives for Southeast Alaska in 2005. A draft copy of the study, dated March 7, 2007, was used as a reference for this report. The study provides valuable information regarding the types and volumes of solid waste generated by the communities of Southeast Alaska. It also summarizes how towns and villages dispose of their solid waste and their costs, billing rates and problems and issues they encounter.

The study discusses optional types of treatment, processes and disposal that would be possible at a regional facility. It elaborates on these methods to a limited extent with indications as to which would be feasible, marginally feasible or likely not feasible.

The study discusses issues such as formation of a regional authority that would provide solid waste disposal services while also being eligible for grant funding and having reasonable limitation of liability. This apparently led to legislation enacted by the Alaska Legislature in 2006 that authorized the establishment of regional solid waste management authorities.

Sources of funding, economics, costs, transportation and revenue are also discussed. Population data for towns and villages are included in the report, with projected volumes of solid waste that could be expected at a regional facility.

3. Solid Waste Disposal Facility Functions

A regional solid waste disposal facility could serve many different functions depending on economics of the facility's startup cost and each process's operating costs, market demands and several other factors outside the scope of this report. The Southeast Conference Study said that any Regional Solid Waste Treatment Facility (RSWTF) should include a Material Recovery Facility (MRF) that would be used to sort recyclable materials out of the incoming solid waste stream in order to reduce its volume. Other processes at the RSWTF could also be used to reduce the waste stream entering the landfill. Reduction of the waste stream could also take place at the source by having customers sort their waste into containers specified for recyclables, compostables, trash and putrescible wastes. The available options for processing at the RSWTF are:

a. *Conventional Landfill or Balefill.* All options will require landfilling to some extent. All of the optional processes will result in at least residual wastes that cannot be further used or processed and must be disposed of, presumably, on-site. The residual wastes may be landfilled or compressed into bales then landfilled at the option of the RSWTF operator. Landfilling would occur in cells that would require liners impermeable to water flow to prevent intrusion of surface water runoff and protect groundwater from leachate generated within the cells of the landfill. Leachate will have to be treated prior to its discharge to marine waters or other means of final disposal. Some manner of collection and discharge will be required for gas, usually methane gas, generated in these enclosed cells. The configuration of the landfill cells will be adapted to fit the site and would start at a low point and work laterally outward and upward with additional new cells. Eventually the landfill would reach its maximum size and height and a final cover would be constructed over the top. The cover would be graded, surfaced and seeded to prevent ponding of water over it, promote positive runoff of surface waters and grass or other vegetation planted upon it would take up some of the rainfall and prevent erosion of the cover. It may be possible to use the landfill after its closure for athletic fields, a golf course or other uses that would not damage it. With closure though, the facility's owners will still have a responsibility for its maintenance for many years to come, likely 30 years or more. The cover will have to be maintained, as will the gas discharge and leachate collection and treatment systems, all of which will require continued monitoring and testing. Landfill permits now require demonstration of financial assurance so that the regulatory authorities know that the owner has the financial capacity to operate and maintain the landfill properly during its full life cycle, including the closure and post-closure periods.

b. *Composting.* Approximately two-thirds of municipal solid waste (MSW) is compostable. The U.S. Environmental Protection Agency defines composting as "controlled biological decomposition of organic material in the presence of air to form a humus-like material." (www.epa.gov/OCEPAterms/cterms.html) Composting involves the shredding, mixing and combining of organic materials in the solid waste stream and allowing them to decompose under controlled conditions. The end result can be used as a final capping material at the site or, in some cases, as a finished product for sale off-site. There is significant cost involved in producing an end product that is pathogen-free and can be sold to the public, so the SE Conference's study concluded that composting a large percentage of the waste stream may not be cost effective. Compost generated at the facility could be used as final capping

for closed areas of the landfill that are to be seeded, cemetery lawn areas or other municipal projects that involve landscaping.

c. *Shipment Off-Site for Final Disposal*. Shipment of a large volume of solid waste from points throughout Southeast Alaska to a RSWTF, only to have it shipped to the Lower 48 for final disposal would seem to defeat the purpose of having the RSWTF in the first place. Presumably, though, some materials recovery would take place prior to the final shipment south, but it would still seem unlikely to be cost effective. The site could be used, however, as a collection point for wastes that would have to be shipped south for regulatory purposes and/or economics. Hazardous wastes, for example, would have to be shipped to a more specialized landfill for final disposal. Large metallic items, such as scrap metal, wrecked automobiles and large appliances have significant value in the scrap metal market and could be collected and stored at the site until the volume warranted a full barge shipment to a scrap metal dealer.

d. *Waste-to-Energy.* Conversion of waste materials to a source of energy provides several benefits to the area it serves. Combustion of the waste reduces its weight and volume significantly (by 70% and 90%, respectively), renders the remaining residue as an inert ash and generates electrical energy for use by the power grid, or grids, serving the facility. The ash may be classified as hazardous waste, however, and if so must be disposed of at a hazardous waste landfill.

As a fuel, solid waste is seen as a very reliable source of power, since society is continually generating it. Hydroelectric plants sometimes have trouble generating power due to dry periods and a subsequent lack of water, diesel or coal-fired power generation can be problematic due to availability of fuel, but solid waste is widely available and is generated at a consistent and reliable rate.

This is the most complex option for solid waste disposal because of all the considerations involved in the planning and operation. It involves more permitting, zoning and aesthetic affects than a standard landfill due to the airborne emissions, but also requires the use of a landfill for the final disposal of its ash residue. Energy generated from the facility is a benefit to nearby communities, however there must be commitments in place for the purchase of the power, an available power distribution grid and a demand for that power in order to make use of it. In addition, power sales agreements can be problematic for the facility if shutdowns occur and it is not able to provide electrical power according to those agreements.

e. *Recycling* Recycling diverts waste destined for final disposal to a point of re-use that decreases the volume of the overall waste stream can generate revenue through the sale of recycled materials. It has been gaining support through public education efforts for many years and has been very successful in some areas. For a remote area like Southeast Alaska, recycling involves collection and storage of recyclable materials for shipment to a final processing facility in the Lower 48 states. To achieve success, an intense program of public involvement is necessary to provide separation of recyclables at the source.

f. *Hazardous Waste* The facility could accept hazardous waste that is destined for final disposal at a specialized landfill in the Lower 48 states, or burned in an on-site incinerator approved for such use. Facility employees would have to be trained in handling of hazardous wastes and a secure area, most likely inside a building, would have to be designed and built for its storage for extended periods between off-site shipments. Because of the complexities and difficulties involved in handling hazardous waste, the facility owners could choose to avoid accepting hazardous wastes, but as part of operation of a landfill, they would have to agree to assure ADEC that measures would be taken as part of the facility's normal operations to prevent the acceptance of hazardous materials.

These processes can augment each other in various ways. All involve specific requirements of the facility, but some can be of combined uses to several processes, such as equipment and buildings. All can generate revenue for the facility, but there is also risk and liability involved, also.

4. Facility Requirements of Site

For any site to be viable for use as a RSWTF it must have some basic attributes. This section will provide a discussion of those attributes.

a. Access

A RSWTF must be accessible to allow delivery of solid waste in bulk volumes, as well as for access by the general public, its employees and delivery of other goods and services. Access will also allow off-shipment of materials that will be shipped elsewhere, such as scrap metal and hazardous wastes not ultimately disposed of on-site.

Bulk delivery and off-shipment by other methods can be very advantageous to a site, such as by railroad or waterborne vessels, such as barges.

b. Power

Power, in the form of electricity, is required to power on-site machinery, such as balers, conveyor systems, boilers, and blowers, as well as lighting and heat. Electrical power provided by an outside utility, if available, is far more desirable than generation of power on the site, unless it is part of a Waste-to-Energy facility.

Access to an electrical power grid can allow distribution of power generated at the facility to off-site users. Sale of power can only take place through a sale agreement with the facility's electric utility, however.

Facility heating and combustion of solid waste can utilize fuels such as propane, natural gas or diesel fuel.

c. Other Utilities

Access to water, sewer and telephone utilities provides essential services needed by any RSWTF.

Water is needed for domestic use in bathrooms and showers by employees, washdown for general maintenance and operation and for process water in waste-to-energy plants. Potable water is not needed in large volumes for employees due to low daily usage; however large volumes could be required by an incinerator for process water. Use of a well would not be permitted on the site, due to the ADEC-required separation distances between wells and sources of contamination, which would be the landfill itself. A roof catchment system, as is commonly used in Southern Southeast Alaska, would not be advisable at a landfill site due to potential for windborne contaminants, waste from birds, etc. affecting the catchment area. Use of an on-site holding tank for water trucked from a nearby approved public water system would be feasible.

Treatment is required for domestic wastewater generated by employees and, to a small extent, visitors to the facility. Leachate collected in a landfill or balefill would ideally be treated by an off-site utility, but can be treated by an on-site treatment system. Treated wastewater effluent would have to be disposed of off-site. The best alternative for final disposal would likely be a marine outfall. Subsurface disposal in a drainfield would be problematic and likely not approved of by the State of Alaska due to poor soils conditions.

Treatment would also be required for surface water runoff from the site. This may be achieved by a surge basin that would allow settlement of solids before discharge. Runoff water can be minimized by placing the actual tipping floor inside a building to prevent rainfall contacting the solid waste as it is dropped off at the site. Grading the site to divert runoff around the active areas can also reduce the need for stormwater treatment.

d. Topography

Some general parameters for location of a landfill site include topographic features that are beneficial to the landfill. A landfill is built from the bottom up over its life cycle, so a low-lying area would be far more desirable than a high location. The finished landfill, as a general rule of thumb, should not project above the peaks of adjacent land masses to avoid public perception of a "mountain of garbage". Constructing a site wholly in the bottom of a valley can be problematic due to the need to maintain existing natural drainages through the site. If possible the entire site should be located far enough above the base of a valley to allow natural drainage courses to flow unobstructed and without contacting the landfill cells. Building along a hillside can be advantageous if the site is carefully selected. It should not have large streams flowing through the site and small streams, if any, should be directed around the site by a combination of ditching and piping the water flow. The natural slopes can be used for access roads to the low end of the site where construction of the bottom liner and row of landfill cells would occur. Natural slopes can also form lateral boundaries for the landfill and support the liners along its sidewalls. Excavation for the lowest level of cells would result in rock that could be used as cover material. Cells could be constructed farther, laterally, into the hillside, then upward, or the cells could be stepped up the hillside. Ideally the finished slopes of the landfill cover after closure should be between 3:1 and 5:1 or 33% to 20%, respectively. Excessively steep slopes can result in erosion of the cover by rainfall runoff, and excessively shallow slopes can result in ponding of water over the cover that could percolate into the top of the landfill.

e. Site Facilities

The site will have permanent buildings and structures for at least some of the processes that may be used on the site. Scales for weighing vehicles entering and exiting the facility will be needed in all cases. An enclosed, or partially enclosed building will be necessary for housing the tipping floor, where solid waste is dropped off in bulk loads and by the public. The building will need a thick concrete slab floor that will provide a smooth, hard surface for driving trucks and operating equipment used to pick up and sort the waste. The slab may be sloped to internal drains for collection of washdown and other excess water. Thick concrete "push walls" will be needed for storage, sorting and movement by a front-end loader. The building would need enclosed, heated spaces for offices and bathrooms, also. The building will house various stationary equipment used for the processes operated at the facility, which may include conveyor systems, incinerators, blowers and other mechanical equipment.

In the exterior areas, process operations such as composting may require concrete slabs and/or asphalt pavement, as well as stormwater, wastewater and leachate collection and treatment equipment. Water and fuel storage tanks will also be required, the sizes of which would be dictated by the process operations that take place at the facility.

All of these facilities will be permanent and will require sound structural foundations for their placement. While these areas are currently covered in a thick organic layer, it appears that bedrock is relatively shallow at both of the subject areas, which is an excellent foundation material. The organics and other unsuitable soils would be stripped from the sites of buildings and structures prior to their construction. Configuration of the buildings and structures would be such on the site to allow for bearing on a structural embankment of shot rock directly over bedrock to prevent settlement of these structures.

The bottom layer of landfill cells would similarly be founded directly on bedrock or on a structural fill directly on bedrock, to provide a sound structural base for the landfill. The bottom liner of the landfill would be installed directly over an exposed surface of bedrock. Grading of the liner's surface will be achieved with shot rock or gravel fill as necessary. Placement of the landfill cells on sound structural soil strata is very important because it will prevent settlement of the landfill cells that would cause damage to cell liners in the upper layers of cells and the final cover of the landfill. Damaged cover and cell liner materials result in intrusion of surface water runoff into the landfill cells and ultimately increase the volume of leachate generated by the landfill.

Open storage areas for shipping containers, heavy equipment, vehicles, refuse and recycling collection dumpsters would not require a sound structural soil foundation such as that required for buildings. Accumulation of bulk metal waste, such as appliances, automobiles and scrap metal, can take place in similar open storage areas without extensive structural soil foundations. Presumably these items and materials could be stored on top of finished landfill cells and moved as required by landfilling operations.

A no-build setback of at least 50 feet from the facility's boundary would have to be maintained throughout the life of the facility. In addition, fencing would have to be installed and maintained along the facility boundary for purposes of security and catching windborne waste.

f. Surrounding Areas

Ideally a RSWTF would be located at a site that is compatible with surrounding property development and uses. Generally this means it would not be constructed in or near residential areas, near schools or other uses seeing high frequency of uses by the general public. It is also ideal to place the facility in an area that is not foreseen to see those uses in the future. Upon final closure, the facility could see use as a publicly-used area, such as a parking lot, golf course, athletic fields, etc. Zoning, local and state authorities should never allow a closed landfill to be developed as a residential area or for schools for reasons of public health, as well as structural considerations.

Selection of a site that is relatively remote and surrounded by large areas of land controlled by a state or local agency will provide a setback from exposure to residential or other uses involving high concentrations of the general public. Assurance of such ownership of surrounding lands into the future is another important consideration of the selected site. The setback distance will provide protection from noise, odor, air emissions and aesthetics associated with the facility.

5. Pre-Construction Regulatory Requirements

As with any project of any significance there are regulatory requirements that must be met prior to construction and operation taking place. A solid waste treatment and disposal facility, because of its complexity and the inherent risks involved, requires a great deal of review and permitting by all levels of government. It will involve opportunities for public comment, likely at several stages of the permitting process. This section will provide a discussion of the permitting considerations that will be involved in development of such a facility.

a. Site Location

The site should be located in an area consistent with the overall land-use planning of the surrounding area. This would include zoning of the lands chosen for the selected site and whether any conditional use permits might be required of the local planning authority. Whether a facility is consistent with surrounding lands that are undeveloped may become a point of contention. With the two subject land areas available for selection, some would argue that there is no surrounding use, so a RSWTF would be consistent, while others would argue that it is not compatible with the natural setting of undeveloped lands. There is no formal zoning of this area by the City of Thorne Bay at this time, as that function is carried out by the State under its ownership. The Prince of Wales Island Area Plan of October, 1998, lists land uses for this area. The AMHLTO and DNR lands studied herein are shown as being Mental Health and State Owned Lands, only, within Unit 11, Thorne Bay; Subunit 11c of the Prince of Wales Island Area Plan.

The size of the proposed site is also very important that it provide a useful life long enough to make its construction viable, which is generally at least 10 years, and normally 30 years or longer.

Because the South Thorne Bay/Kasaan Road is not administered by the Alaska Department of Transportation and Public Facilities, it will not require permitting for driveway access. However, State standards should be followed for site distances for the driveway intersection, driveway grades and angles of intersection with the existing road to prevent potential problems with ingress and egress for large vehicles at the site.

b. Site Development and Building Codes

Most sites will require a local and possibly state, review of construction plans for such a facility. The plans would include clearing, excavation, structural fill embankments, building structures, foundations, paved areas, grading, drainage, access roads, utilities, mechanical, electrical and control systems. In a site without local building authority, many of those issues may proceed to construction without prior review. The facility developer could see this as being to their advantage, as some see building codes and other regulation of construction as a hindrance and nuisance that only increases construction costs. It is true that building codes are generally very conservative and set a high standard for design, materials and construction practices, but in doing so they normally provide a better finished product that is safer, will have a longer useful life and will be less likely to need repair or replacement. A proper design will also prevent facilities from being over-built and thus excessively costly.

For a local government without building code authority, holding the design and construction of a new facility to a high current standard will be to their benefit in the long run. Many large facilities undergo a review of several tiers such that high-quality construction plans will speed the other components of the project's review process. In the case of a RSWTF, proper site planning, design of drainage, utilities, process equipment, buildings and other structures will aide in obtaining the solid waste facility permits required by the State of Alaska.

c. Landfill Permit

At the heart of the facility's permitting process will be the solid waste disposal permit required under ADEC Solid Waste Regulations (18 AAC 60). The ADEC permit review will include all aspects of the facility's design, construction, operation, shutdown and long-term maintenance of the site after final closeout. They will review the overall site configuration and location. The site location considerations will include proximity to surface waters such as lakes, ponds, streams and marine waters, anadromous fish streams, drinking water wells, groundwater conditions, processes proposed for the facility, equipment proposed, landfill cell construction and configuration, control and treatment of leachate and gas generated within the landfill cells and surface water runoff. Employee facilities, including provisions for domestic water and wastewater, and personal safety will also be reviewed. The State generally also requires that all other state and local requirements are met of the facility, which normally includes public review and comment.

The State will also review proposed treatment processes for landfilling, baling, composting and incineration and will want specific information about the equipment used, operation of the facility, operator qualifications, whether any energy is generated by the facility and final closeout and use of the site once its operation ceases. They will require assurance that the facility owner will have finances in place to cover the cost of closure, or closing down the landfill once its life cycle is over and for the costs of maintaining the facility during the post-

closure period. The post-closure maintenance period includes maintenance of site security, restricting access to the site, maintenance of leachate and gas control and treatment systems, and maintenance of the landfill cover materials to assure they are not damaged by erosion or settlement. It should be emphasized that the post-closure period can last 30 years or longer and if not properly planned for, can be a huge liability for the facility owner.

Financial assurance can also include provisions for a minimum amount of solid waste volume supplied to the facility over its life, to insure its viability and continued operation over its design life.

The plan for the ultimate use of the site after closure will be required under the State permit. The State will want to know that its ultimate use will be compatible with the closed state of the landfill. It should not damage the cover materials and cause intrusion of surface water into the landfill cells. Uses should not damage the landfill structurally such that the leachate collection or gas discharge systems would be affected. If the site would not be safe for human uses, even for recreation, secure fencing and active security would be required; otherwise the site may be used as a public facility for recreation or for other uses. Use of the site for residential purposes, for use as a school or some other use would not be allowed by the State.

d. Site Drainage

Site drainage is important in that it can greatly reduce the amount of rainfall and surface water runoff that comes into contact with the facility. Reduction of the contact limits the amount of contaminants absorbed by that water that will need to be treated later and thereby reduces the risk to neighboring lands that might be affected.

For the construction period of the facility, a stormwater pollution protection plan will be required due to the size of the area under development. The plan will include measures to be taken that will prevent siltation of nearby streams and monitor the condition of temporary dams, silt fences and other controls set in place during rain events.

e. Geology and Hydrogeology

The site must be a minimum distance of 200 feet from geologic faults, not located in a seismic impact zone or in an area that is unstable such that it may be susceptible to landslides or other ground movement that could affect the integrity of the structural components of the landfill. The soils at the site should have the structural capacity for supporting the landfill without settlement that could result in damage to the liner under the landfill or the final cover over it. Good structural soils are also important for supporting the other permanent structures at the site, such as buildings.

f. Groundwater Conditions

Groundwater conditions must be demonstrated as part of the permit process to determine what impacts might occur to any aquifers in the area. Permeability of the soils, aquifer depths and types, proximity to users of groundwater, if any, will also be considered. Background groundwater quality analysis will be required to establish a benchmark for future comparison. If the aquifer at the proposed site is of a "resource value", permitting of the site may be very

difficult. It is possible that even in areas of shallow bedrock; the resource value of the aquifer could be high enough to preclude its permitting.

Groundwater monitoring wells will have to be provided as part of the facility's design and construction, and sampling and analysis of the well waters will be part of the normal operation and then used during the closure and post-closure periods for continued monitoring of the site.

g. Air Quality

For a facility that proposes incineration of solid waste, air conditions must be considered similar to the manner in which groundwater conditions are studied for a landfill. Weather patterns and conditions must be studied to gauge effects on surrounding lands. Ambient air quality testing is also required to established background conditions for future comparison.

An ADEC air quality discharge permit would be required for air emissions from an incinerator and would include sophisticated control systems and continuous monitoring of the air emissions for several parameters. Qualified personnel will also be needed to operate the process and control equipment and specialized contractors will be needed to perform maintenance, repairs and routine testing of the emissions control systems.

h. Utility Design

Ideally, utility services required by the site are provided by local utilities. A solid waste facility will require all manner of utilities; potable water for employees and process uses, wastewater treatment for that generated by employees, landfill leachate and stormwater runoff. Electrical power is required for equipment, lighting and general uses on the facility. Telephone communications are also required for communication by phone, electronic mail and sometimes for control and security systems.

If not provided to the facility by a public utility, these services must be established at the site. Water provided to employees must meet State standards of potability and operation. Normally, an on-site system of obtaining water from nearby surface waters, groundwater wells or roof catchment systems would be used as a source of raw water. For a landfill facility, obtaining water on-site by nearly any means would not be advisable, and not allowed, by the State due to the risk of contamination posed by the landfill operations. If water cannot be piped to the site from a source known to be safe, hauling the water by an approved water hauler tank truck is the next best option. The truck and water storage tanks on the site would be part of the review process and water would have to be hauled from a public water system in good standing with the State. A contract with the water hauler would also be required, or the truck could be supplied to the facility as part of its equipment.

Wastewater treated on-site will involve the installation of a secondary aerated package treatment plant. It may be possible to treat landfill leachate with the same treatment plant located at the site. Ultimate disposal of treated effluent would be of special concern to the State. If it is of a certain quality, it may have use as recycled water used for washdown on the site. For final disposal though, subsurface discharge in a drainfield is one possibility, however local soils conditions are very poor for this use and probably would not be allowed. Soils conditions in Southern Southeast Alaska include soils with very poor percolation rates, shallow bedrock,

excessive groundwater in some areas, steep ground slopes and all are exacerbated by high rainfall. Normally a deepwater marine outfall is the preferred choice for final discharge of treated wastewater effluent, but the cost of such disposal increases with the distance to a water body with adequate depth and flushing action for the proposed volume of wastewater. Disposal of wastewater in excess of 500 gallons per day also will result in the facility needing a State-issued wastewater discharge permit. The discharge permit will require periodic sampling of the wastewater effluent and of the receiving waters where it is discharged.

i. Power Generation and Sales Agreements

Should the facility operation involve combustion of solid waste that would be used for energy recovery, the sale of excess power may provide an opportunity for generation of its own electrical power and for cost recovery for the facility if there is excess power that can be sold to the local power grid.

Power generation becomes somewhat complex though, in that sales of power generated must be at an agreed-upon rate between the power utility and the solid waste facility. Some sales agreements also include penalties if the power supply to the electric utility is interrupted. There also has to be a demand for the excess power generated and the power grid must be available and have the conductance capacity for the excess power provided.

j. Wetlands

For reference, the Corps of Engineers (*Federal Register 1982*) and the EPA (*Federal Register 1980*) jointly define wetlands as: *"Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."*

As part of the landfill permitting process, the State does not allow construction of a landfill in areas designated as wetlands unless its construction and operation will not cause water quality violations, violate effluent standards related to toxicity or jeopardize any endangered or threatened species. It also will not be allowed to cause significant degradation of any wetlands. To a certain extent, construction may be allowed to impact some wetlands, if no other lands are available and in some cases, under mitigation for other lands or finances. A full permit application to the Corps of Engineers regarding wetlands at the site will be required.

k. Wildlife

Permitting will involve review by natural resources agencies with regard to possible effects on wildlife in the project area. The most significant concern will be related to anadromous fish streams that are established and cataloged by the Alaska Department of Fish and Game. Cataloged fish streams on or directly adjacent to a proposed RSWTF will likely be an insurmountable obstacle for the project, especially if other potential sites are available. Measures will have to be taken during construction to minimize siltation of cataloged streams or drainages that lead to cataloged streams as part of a stormwater pollution plan. It should also be noted that the head of Tolstoi Bay, which may be the best choice for final disposal of treated leachate effluent from the RSWTF, is indicated as being crucial habitat.

Endangered species may be a concern in development of the project, but bald eagles with nests in the area of the project may be the only such concern encountered.

l. Cultural or Historic Significance

A review of the selected site's possible cultural and historic significance will be required by the State in conjunction with the State Historic Preservation Office. The Prince of Wales Island Area Plan lists several sites of cultural or historical significance in this area, but they do not provide specific locations. In order to protect those sites, the applicant is required to submit project data, including location and proposed development, to which they respond as to whether the project will impact any sites that should be protected.

6. Facility Improvements, Equipment and Personnel

Improvements necessary for operation of a RSWTF will be many, and will depend on all of the processes chosen for the facility. The types and amount of equipment needed and the number of personnel and their functions will also vary with site processes.

Assuming the facility will have its basic function as a landfill for putrescible and inert wastes accepted from communities throughout Southeast Alaska, the following conclusions must be made.

a. Solid waste will be compressed into bales at each community to allow more efficient shipment to the site. Baling will allow more solid waste to be shipped in an enclosed container. For example, the Cities of Thorne Bay and Ketchikan compress their solid waste into bales measuring approximately 3 feet by 4 feet by 5 feet, each weighing approximately 2,500 pounds. In this manner they are able to ship approximately 30 tons of solid waste in a 48-foot long enclosed shipping container. The containers allow transport of the solid waste to occur without loss of loose garbage and without exposing it to ambient weather conditions, primarily rainfall. The City of Ketchikan is able to ship the putrescible waste generated over a week's time in seven of these shipping containers.
b. The bales would then transported to the RSWTF by truck and/or barge shipment for placement in the proposed landfill.
c. The facility will own several dozen shipping containers made for shipping bales. The shipping containers will be staged out of the site itself, as they will contain residual leachate after shipment and will have to be staged at the facility in order to assure that the leachate is contained on the site. At least one or two semi-tractors will be dedicated to transporting the containers to and from the Tolstoi Bay barge landing.
d. Scales will be located at the facility entrance to record weights of incoming and outgoing vehicles and containers as a means of measuring the amount of solid waste brought to the site.
e. The landfill will be constructed in a full-bench cut at the site such that its substrate will consist of exposed bedrock covered with a bottom liner approved by ADEC.
f. The landfill's construction will include cutting into bedrock soils on the site that will then be processed into the required daily cover material on the site. The daily cover material will likely be well-graded crushed rock that will be processed, transported,

spread and compacted by equipment owned and operated by the facility. With that, the facility will essentially have its own heavy equipment for transport, processing, spreading and compacting of the rock.

g. Solid waste will be delivered to the site on a "tipping floor" inside an enclosed building. The building will have a reinforced concrete floor and internal drains and collection system for water inherent to the waste. The building will prevent spreading of loose garbage by wind, will cover the waste from precipitation and entrap odors to the extent necessary. If necessary the building can be fitted with a negative air ventilation system that will trap odors inside the building and process the air through a filtration system prior to discharge.

Under those conclusions, the facility will need the following improvements, equipment and personnel:

- One weighing scale each for entering and exiting vehicles at the entrance. A fully enclosed and heated scale shack with full heat, electricity, and communications would be necessary. The building would be 300 to 500 square feet in size.

- A central receiving building with approximately 30,000 square feet of main floor area for offloading of solid waste. The building would be fully enclosed with large operable doors for vehicles, trucks and equipment to enter and exit at several different bays. The building would also house office areas, bathrooms with showers and other administrative rooms needed, such as conference room. The interior of the tipping floor would not be fully finished or heated, but the administrative and employee spaces would.
    i. A baler would be located inside the building for baling of solid waste brought to the facility from other areas of Prince of Wales Island. The baler would also be used for compressing other waste materials, such as large appliances.

- A fully enclosed shop building at least 5,000 square feet in size with two or three bays to park equipment for maintenance and repair and store parts and materials. This building would have to be at least partially heated.

- Fuel storage tanks for vehicles and equipment.

- Water storage tanks for domestic, process and firefighting uses.

- Wastewater treatment systems for domestic wastewater, leachate and stormwater runoff. Possible options for treating wastewater could include use of holding tanks and tank trucks that would truck the waste to an approved treatment plant.

- Security gates and fencing would be required of the facility from construction through the operational phase, at least, to prevent unauthorized access. Depending on the use of the site after it is closed, it may have to be restricted during its post-closure period as well.

- Outdoor parking and storage areas would required for parking vehicles, waste shipping containers and equipment, storage of bulk waste such as appliances, wood and organic waste as would be generated in clearing of the site and miscellaneous storage. A site for storage of cover material would also be necessary.

- Some options for consideration would include accepting wrecked vehicles with equipment on-site for crushing or cubing them to a much smaller volume. Accepting small vehicle tires could also generate a volume of one tire per person served per year, easily reaching tens of thousands of tires per year.

- Equipment required would be estimated as follows:
  i. At least one track-mounted hydraulic excavator for movement of bulk waste items and movement and loading of rock for processing and cover.
  ii. A metal-wheeled sheepsfoot compactor with a dozer blade for spreading and compacting of waste.
  iii. A tracked bulldozer for movement, compaction and grading of solid waste and rock cover.
  iv. At least two ten-cubic yard dump trucks for transporting waste debris during clearing operations and rock during excavation and processing.
  v. Several dozen shipping containers for shipment of solid waste to and from the site from users of the facility.
  vi. At least two semi-tractor trucks for movement of shipping containers to and from the barge landing area.
  vii. A rubber-tired front-end loader for rapid movement and loading of solid waste and rock cover material, as necessary.
  viii. A tub grinder for chipping of wood debris for reduction in volume and use in cover material.

- Personnel needed would be as follows:
  i. Sales and Administration Min. 2 to 3 persons
  ii. Equipment Mechanics Min. 2 persons
  iii. Scale attendants Min. 2 persons
  iv. Landfill operations Min. 6 persons
  v. Possible late shift for processing and spreading cover material Min. 2 to 3 persons

We estimate the area required for the above facilities would be 10 to 12 acres in size and would require good structural foundation soils for the buildings and structures.

Other processes at the facility would require additional facilities and areas as follows:

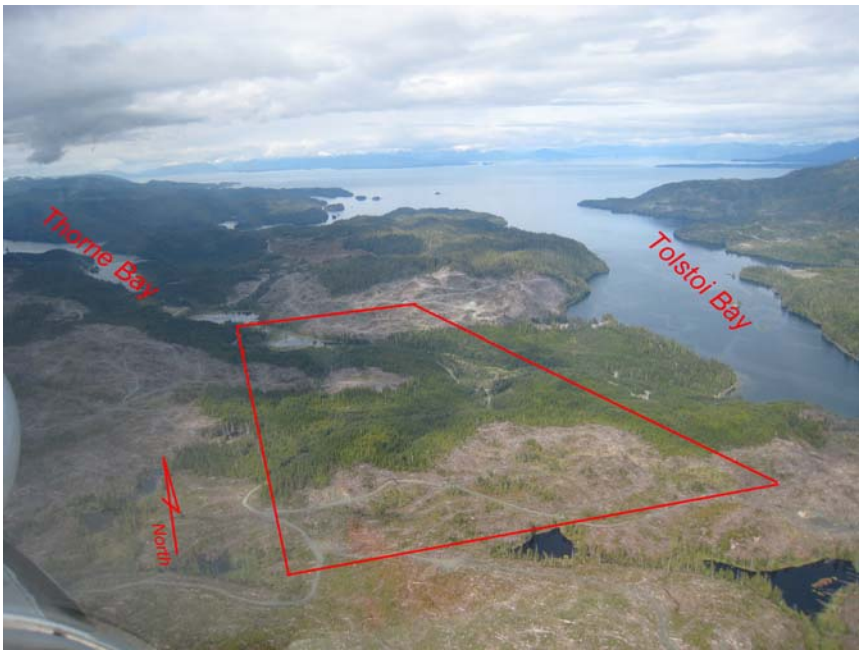
- Composting operations
  - Additional tipping area in central building of at least 5,000 square feet.
  - Exterior areas paved with concrete and asphalt with concrete endwalls, underdrains and air channels for compost heaps. Heaps would be covered during compost process. First stage of three-stage compost process would

require a concrete slab due to heat generated by compost. Second and third stages would be set on asphalt pavement.
  - Tub grinder would be required for chipping waste to uniform size.
  - Finished compost would be stockpiled in open area of site.
  - An additional site area of approximately two acres would allow for production of approximately 5,000 tons of compost per year.
  - One or two additional persons would be required for composting operations.

- Incineration operations with energy recovery.
  - Additional building area will be needed to feed waste for incineration, house incinerators, emission systems and control systems. We estimate another 10,000 square feet of building area would be needed attached to the main tipping floor.
  - Conveyor or transport of ash would be necessary. The ash may be classified as a hazardous waste and would have to be shipped to a landfill approved for such disposal. Ash would have to be containerized while awaiting shipment. If the ash can be de-classified as hazardous waste by laboratory analysis, it could be landfilled on-site.
  - An additional area of one to two acres would be needed for the incinerator facilities and electrical substation needed for transfer of power to the power grid.
  - An additional operator would be needed to feed solid waste into the incinerators.
  - Two to three additional persons would be needed for operating the incinerators and emission control systems, also.

7. Proposed Sites for a Regional Solid Waste Treatment Facility

The two areas under consideration are south of Thorne Bay along the South Thorne Bay/Kasaan Road corridor. Both are within the rectangular subdivision such that they can only be described by aliquot parts within their sections, townships and ranges. Both are within Township 72 South, Range 84 East from the Copper River Meridian.



Photograph 1 – Aerial photograph showing approximate boundaries of AMHTLO area under study. Note that converging boundaries are as a result of the perspective view.

The site closest to Thorne Bay, Site 1, is comprised of the southwest quarter of Section 13 and the adjacent northwest quarter of

Section 24. They each comprise 160 acres of land, for a total contiguous area of 320 acres, or 13,939,200 square feet. They form a rectangular area measuring 5,280 feet north-to-south by 2,640 feet in an east-to-west direction. This site is owned and administered by the Alaska Mental Health Land Trust Office.

Photograph 2 – Aerial photograph showing approximate boundaries of DNR lands under study.

Site 2 is near the northwest quarter of Section 25, owned and administered by the State of Alaska, Department of Natural Resources. This site is a square parcel of land measuring approximately 1,600 feet on each side. Its area is 50 acres, or 2,178,000 square feet. This area is bounded on the north by the Thorne Bay municipal boundary, putting it outside the Thorne Bay city limits.

The first site is within the municipal boundary of the City of Thorne Bay, while the second is immediately outside and abutting the City Limits in an area between the south end of Thorne Bay and northeast of Karta Bay. Both agencies have agreed to a transfer of 50 acres to the City of Thorne Bay for use as a RSWTF, with the possibility of transferring another 50 acres at some future date. The DNR lands would be transferred to the City of Thorne Bay free of charge, while the AMHTLO lands would be sold to the City at a cost of $1,000 per acre.

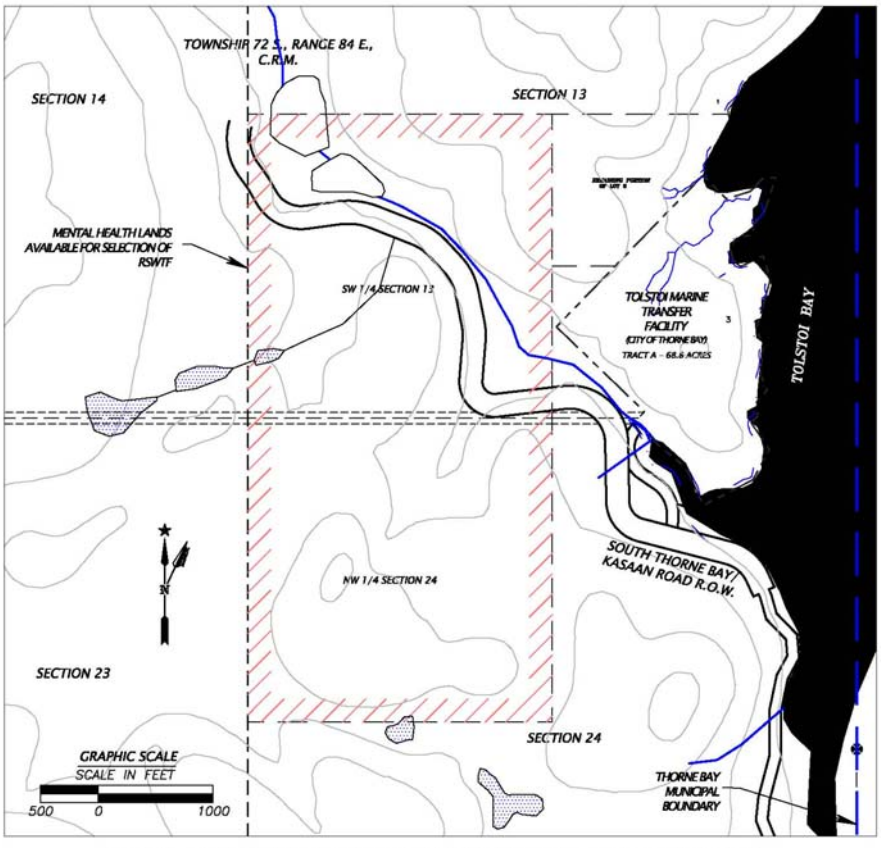


FIGURE 2 – AK MENTAL HEALTH LAND TRUST OFFICE LANDS AVAILABLE FOR SELECTION

Both areas have many characteristics and features in common. They are both:

1. Located on Prince of Wales Island in a relatively remote location, well away from large centers of population.
    a. Both sites are advantageous in that there are no large concentrations of residences or other developments in their immediate areas. The surrounding lands are large contiguous tracts owned by the State of Alaska and Alaska Mental Health Lands Trust Office.
    b. The location of both sites is not advantageous in that essentially all of the solid waste will have to be trucked from distant areas of Prince of Wales Island or shipped in by barge from other areas of Southeast Alaska, some as far as 250 miles away.
2. By straight-line distance, five to six miles southeast of the downtown area of the City of Thorne Bay and five to six miles northwest of the City of Kasaan's core area. Their distances to both towns make them unlikely to cause odor problems for either town.
3. In the same maritime climatological area due to their close proximity to each other. The area is dominated by maritime climate influences, including small variations in temperature, high humidity, large amounts of precipitation, high frequency of fog and clouds. The area has cool summers and warm winters with strong and persistent surface winds

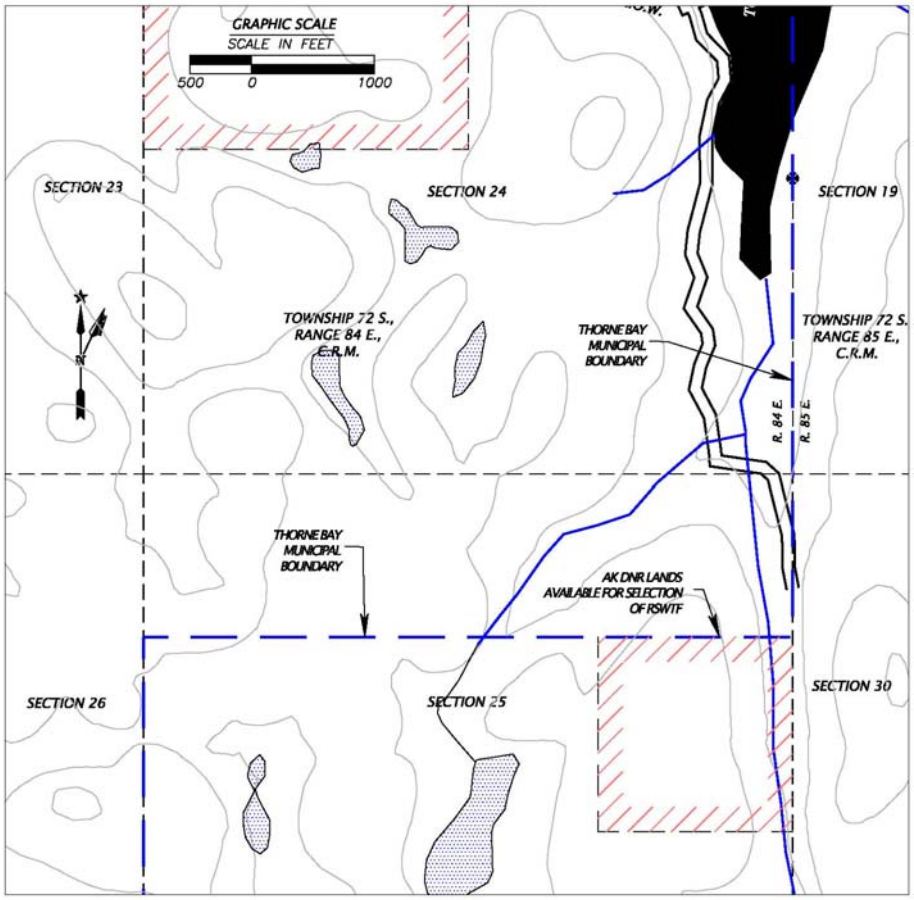


FIGURE 3 – AK DNR LANDS AVAILABLE FOR SELECTION

    a. The mean annual temperature is approximately 45°F
    b. The mean maximum temperature in July is approximately 64° F.
    c. The highest maximum temperature is approximately 86° F.
    d. The mean minimum temperature in January is approximately 38° F.
    e. The lowest minimum temperature is approximately -5° F.
    f. There are approximately 175 days per year with at least 0.1 inch of precipitation.
    g. Mean annual precipitation is 80 to 100 inches.

    h. Prevailing winds are from the Southeast. The 2003 International Building Code gives a basic wind speed for this area of approximately 120 miles per hour.
4. 90 to 100 miles east of the nearest seismic fault shown in mapping in the 2003 International Building Code, as prepared by the U.S. Geological Survey. Located in an area of low-lying hills that vary in elevation from 100 to 400 feet. Ground slopes are mostly moderate, in the range of 5 to 20%, with a few isolated small areas sloped up to 100%.
5. Accessible along the South Thorne Bay/Kasaan Road between the Cities of Thorne Bay and Kasaan.
    a. The road is a full-width, gravel-surfaced road that is open year-round. It is a community road, so it is not actively maintained by the State of Alaska or the U.S. Forest Service. The South Kasaan Road is accessed directly off of the paved highway between Control Lake and the City of Thorne Bay. Most of the population of Prince of Wales Island has direct access to the islands paved highway system and the Coffman Cove Road is undergoing improvements at this time.
    b. The roadway itself is narrow and winding and rough in many areas such that speeds greater than 20 to 25 miles per hour are difficult to maintain for a passenger vehicle. Large truck traffic would have the same difficulties. Should traffic volumes increase significantly, better maintenance would be required, as well as upgrades that would increase safety and design speeds.
6. Located near the City of Thorne Bay's Tolstoi Bay Marine Transfer Facility (MTF), which is within 1 mile of both areas, allowing barge shipment of bulk volumes of solid waste to a point very close to both. Being owned and operated by the City of Thorne Bay and near both sites, this is of equal asset to both sites.
7. Adjacent the Alaska Power and Telephone (AP&T) electric power grid that serves Kasaan from the company's Prince of Wales Island power grid. As such, adequate and reliable electrical power is available to both sites with reasonable service rates. With the power grid proximity there is also the option for both sites to deliver power generated at the facility to the utility. The power conductors have the capacity for carrying in excess of 10 megawatts of power.
8. Outside of the service area of any water or wastewater utilities, so both would have to obtain water for domestic and process uses by hauling water from an approved public water system or by establishing a new public water system for that use. Wastewater treatment systems would be necessary for domestic wastewater generated at the site, as well as for leachate collected within the landfill cells. It may be possible for the domestic wastewater and leachate to be treated with the same treatment plant.
    a. Both sites would require some means of final disposal for treated wastewater effluent. Discharge to the ground surface would not be allowed without an extremely high level of treatment that is not generally feasible. Options for discharge would therefore be limited to a deepwater marine outfall or through a subsurface drainfield. A drainfield for industrial wastewater such as leachate would likely not be feasible due to poor soils conditions and the volume of effluent generated. Both sites are at least one-half mile to marine waters that would be suitable for such a discharge.
    b. Presumably the discharged volume would be well in excess of 500 gallons per day at some point during its life cycle, if not initially. The 500 gallon-per-day value is the threshold for the ADEC wastewater discharge permit requirement.

9. Mostly undeveloped, essentially. Both would require at least some clearing of trees and both would require stripping of other vegetation and overlying organic soils before construction could begin.
10. Partially roaded with a network of logging access roads. The roads are constructed of shot rock embankment quarried from pits in both areas.
11. Characterized with soils conditions that include a thin surface layer of organic-rich soils overlying bedrock at very shallow depths. In some areas there is a layer of sandy, muddy soils between the organics and bedrock. The depth of this layer varies, but is generally less than two or three feet. In some areas bedrock is exposed at the ground surface or can be seen to be very shallow in the numerous quarry sites and cutbanks along road alignments.

The two sites differ from one another in the following ways:

1. The Kasaan Road right-of-way bisects the southwest quarter of Section 13 in a northwest-to-southeast direction, nearly dividing it in two, diagonally. To the northeast of the road is a large pond and stream estuary system that flows into Tolstoi Bay. The stream is cataloged by ADF&G as Stream No. 102-70-10430 with Pink Salmon present and for Coho Salmon rearing.
2. Site 1 has nearly direct road access from the Tolstoi Marine Transfer Facility (MTF). The MTF access road intersects the South Thorne Bay/Kasaan Road approximately one-quarter mile east of Site 1.
3. Site 1 has closer access to the deep waters of Tolstoi Bay, which may be necessary for final disposal of treated leachate and domestic wastewater generated at the facility. Site 2 is south of the head of Tolstoi Bay, which is a shallow marine estuary. A deepwater outfall would have to be installed to allow for wastewater discharge at an estimated tidal level of -10' MLLW to -25' MLLW, per ADEC wastewater disposal regulations. From Site 2, an outfall to this depth would be ¾ to one mile long.

8. Site Selection

The selection process included review of available mapping, aerial observations and site inspections of the two sites. Our site inspections revealed areas on both sites that should be precluded from selection. In precluding areas it should be noted that a standard practice of regulatory agencies in selection of sites will allow some latitude when other sites are available for the project.

The area at the northeast corner of the SW ¼ of Section 13 mentioned previously does not appear suitable. It is bounded on the north and east by the limits of the property offered by AMHLTO. Along the south it is bounded by the South Thorne Bay/Kasaan Road right-of-way. There is also a large pond and stream estuary area that parallels the right-of-way on its north side. The stream is cataloged by ADF&G as a salmon bearing stream. The ground area between the stream and the property limits has a somewhat triangular shape, with fairly steep slopes over most of its area that slope directly toward the stream. The size and shape of the area limits its suitability, as does its ground slopes. The close proximity to the large estuary system would pose a direct risk of contamination from leachate and windborne debris.

Most of the DNR-owned Site 2 is outright unusable because the Kasaan Road right-of-way easement passes through the east side of it, near its east boundary and a significant anadromous fish stream, cataloged by the Alaska Department of Fish and Game, flows parallel to the road through it near the east side. The ground slopes steeply downward toward the stream on both sides of it. The stream is a cataloged salmon stream and flows into estuary at the head of Tolstoi Bay. Precluding these areas leaves only 10 to 15 acres for use as a RSWTF, or less than one-third of it available. This would seem to make the viability of this site very unlikely, because of the 50-acre standard arrived at by the Southeast Conference Study.

There are ponds of significant size throughout the lands to the south and west of Tolstoi Bay. The ponds and immediately surrounding areas are ruled out for use due to regulatory requirements that prohibit placement of a landfill in surface waters, as well as for practical reasons.

Some areas will be precluded because of their overwhelming wetland characteristics. Of the two favorable sites being considered, much of the area has been logged and the majority of vegetation removed; therefore, the 1987 Wetlands Delineation Manual deems that the sites do not exist under "normal circumstances" and need only satisfy the criteria of hydrology to be considered wetlands. All of the favorable sites observed are moderately inundated and otherwise the soils are completely saturated to the surface, which alone satisfies the criteria for wetland hydrology. Furthermore, field observations indicate that much of the soils in these areas are a non-sandy, hydric soil, satisfying the soil criteria for wetlands. The soil was observed to be organic, to have developed anaerobic conditions in the upper soil horizon, and likely hosts a Redox potential less than 120 mV based on the presence of Ferroxidans Bacillus and Iron Sulfide. Although vegetation is not considered in the wetland definition when the site has been altered by an activity such as logging, it is interesting to note that skunk cabbage is a prevalent plant species on both sites. Skunk cabbage is an obligate wetland species and is found to only grow in wetlands 99% of the time.

Based on field observations, at least 25 to 30% of the area of the favorable sites is believed to be wetlands. It also appears that there is not a contiguous 50-acre area within either the AMHTLO or DNR lands available for selection of a RSWTF site that is entirely without significant surface waters or wetland characteristics. Consequently, there may be some difficulty in obtaining a Corps of Engineers' permit. A site that includes smaller, isolated wetland areas, however, may be allowed by the Corps of Engineers under mitigation or other means.

a. Most Favorable Sites

There were no sites that could be described as ideal and without concerns for regulatory reasons, primarily due to the prevalence of surface waters or wetland area characteristics. Two sites were found that would be the best of those available of those on both the DNR and AMHTLO lands studied. All have similar soil characteristics, such as shallow bedrock areas, dense organic-rich soils of varying depths and small drainage courses through them or nearby. All have similar vegetation, also. The two sites have been logged extensively, but it is apparent there were dense stands of red cedar and hemlock trees, as well as underbrush typical of this area. In the low-lying areas we found patches of skunk cabbage, grasses and saturated soils. In these sites, however, the areas of saturated soils and skunk cabbage, which together are a strong indicator of wetlands, were of minimum extent compared to the rest of the available lands.

The sites selected in order of increasing favorability are the Southeast corner of the Northwest ¼ of Section 24 and the center of the Southeast ¼ of Section 13, both of which are both on the AMHTLO lands.

i Second Most Favorable Area – Southeast Corner of Northwest ¼ of Section 24 – AMHTLO Lands

The second most favorable area is at the southeast corner of the Northwest ¼ of Section 24 in the AMHTLO lands. This site is within several hundred feet of the South Thorne Bay Road right-of-way. Most of its area is flat and level and located between hills on the East, South and West sides, which would form natural boundaries for the landfill cells. The area slopes downward gently toward the north and there are no significant creek crossings or areas of standing water. Three existing logging roads make the area accessible at the south, west and north sides by vehicles.

Photograph 3 – First and Second Most Favorable Areas - Section 13 & 24 – AMHTLO Lands

The existing road access from the South Thorne Bay Road crosses other areas of Sections 13 and 24 before accessing this area. As there is a physical separation between the area and the right-of-way, an easement would be required for permanent legal access. The elevation at the area is relatively high in relation

Photograph 4 – Most Favorable Area for use as a RSWTF – AMHTLO Lands

to the nearby South Thorne Bay Road, so a dedicated access road would require an extended route for a reasonable grade. Electrical power and a marine outfall for treated leachate effluent would presumably follow the same alignment. The hills bounding the site would provide a natural visual barrier between the site and the South Thorne Bay Road.

The site does have a fairly large flat area at its center that is covered in grass and some skunk cabbage, suggesting the presence of wetlands.

ii. Most Favorable Area – Center of Southwest ¼ of Section 13 – AMHTLO Lands

The site we found to be the best available is in the center of the Southwest ¼ of Section 13. It abuts the South Thorne Bay right-of-way and the AP&T power line. It is a relatively flat and level area 50 to 100 feet in elevation above the adjacent road grade. It is a relatively flat and level area with no ponds of significant size. One small stream crosses the site from south to north.

With direct access from the South Thorne Bay Road, a road to the site, as well as an electrical power service line could access it directly without the need for easements to cross other lands owned by the AMHTLO.

A pipeline for discharge of treated leachate effluent to a deep water outfall, if necessary, would have to be approximately ½-mile long, but could be routed along the South Thorne Bay Road right-of-way.

A low-lying grassy area with saturated soils and a growth of skunk cabbage plants is at the center of this area and is indicative of wetlands.

9. Conclusions and Recommendations

Construction of a solid waste disposal facility, including a Class I landfill, involves careful analysis and design and a lengthy permitting process. Construction and operation will be very expensive because of the current landfill construction standards and the area's geologic and climatic conditions, primarily the predominance of bedrock soils and high rainfall, respectively. Operations will also require careful planning and attention to detail throughout the operational life of the facility in order to limit problems for the facility that could cause contamination of adjacent lands or other problems. The amount of liability undertaken by the owners and operators of such a facility cannot be stressed enough.

New technologies in solid waste management will be beneficial in some ways and careful planning, design and coordination during the permit process will be very important. Planning will involve all communities in Southeast Alaska to make the establishment and continued operation of the facility viable.

This report has provided a selected site for a regional solid waste disposal facility based on construction, operation and regulatory criteria related to such a facility. One alternate site has also been provided. None of the areas within the selected lands that were studied were without

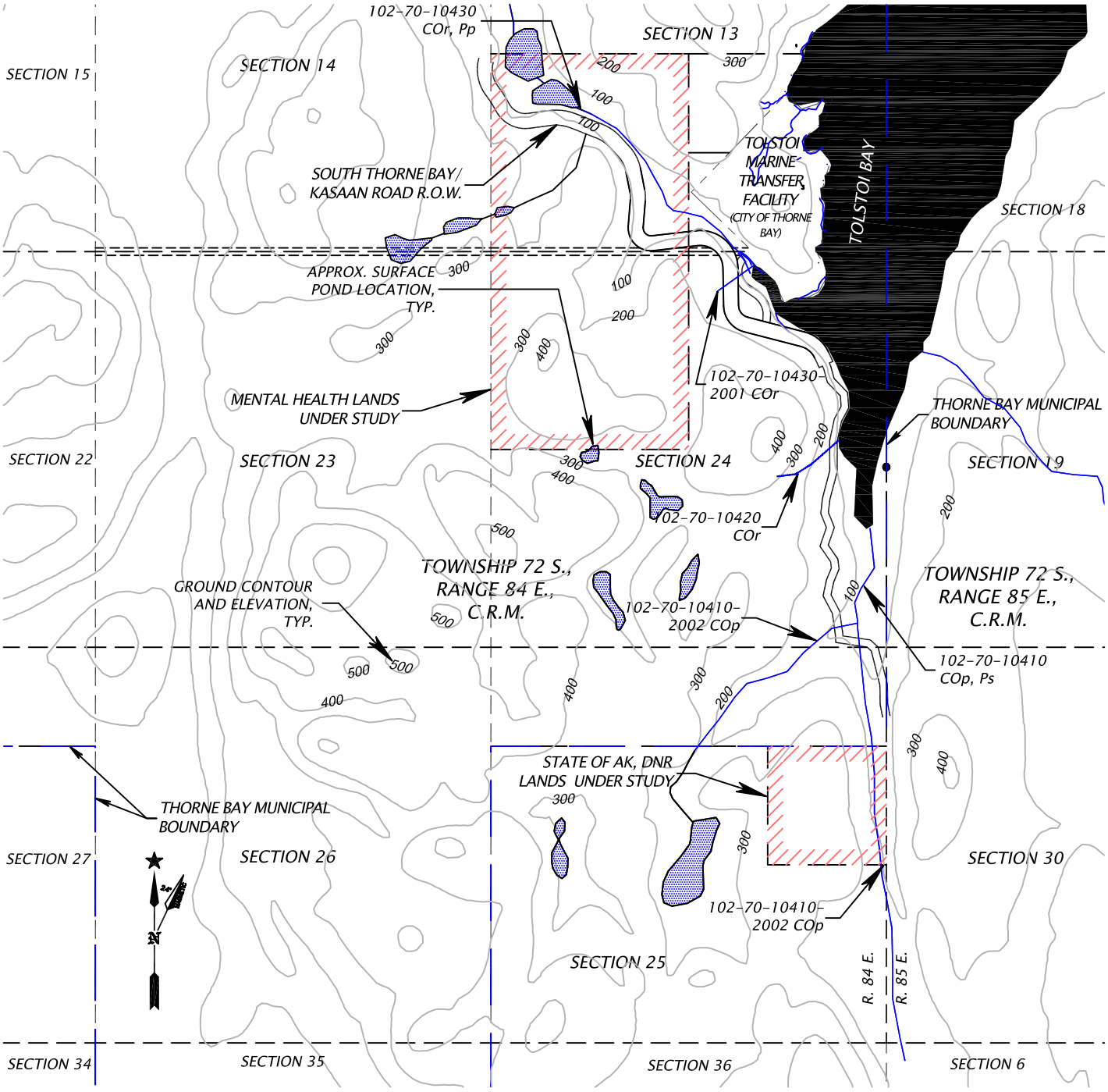
difficulties related to at least some of these criteria to varying degrees, but such a facility could be very beneficial to the City of Thorne Bay and the entire Southeast Alaska region.

Prepared by:

Scot A. Menzies, P.E., L.S. Date: May 25, 2007
R&M Engineering-Ketchikan, Inc.

X. Appendices

i. Lands Available for Selection
ii. Regional Vicinity Maps
iii. Local Vicinity Map

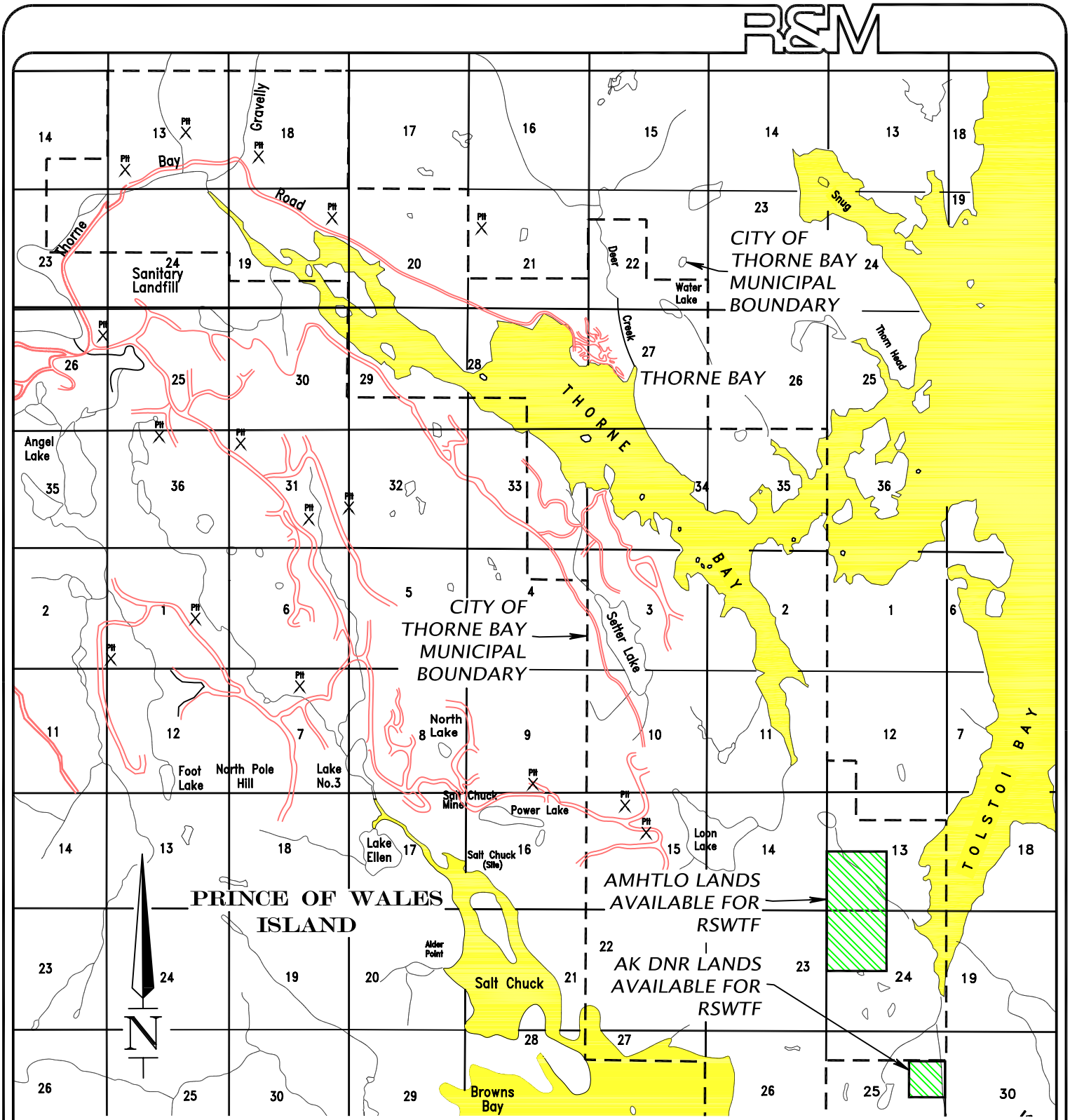


GRAPHIC SCALE
SCALE IN FEET
1000 0 2000

LANDS AVAILABLE FOR SELECTION

NOTES:

1. CONTOURS, STREAM AND SURFACE WATER(PONDS) LOCATIONS ARE TAKEN FROM USFS MAPPING
2. CONTOUR INTERVALS ARE 100 FEET.
3. SOME POND LOCATIONS ARE NOT SHOWN.
4. ALASKA DEPARTMENT OF FISH AND GAME ANADROMOUS FISH STREAM LOCATIONS ARE INDICATED WITH CATALOG NUMBER AND SPECIES DESIGNATION AS: (102-70-10430 COr).
   a: SPECIES DESIGNATIONS:
   CO - COHO SALMON
   P - PINK SALMON
   r - RESIDENT
   p - PRESENT
   s - SPAWNING



LOCAL SITE VICINITY MAP
REGIONAL SOLID WASTE TREATMENT FACILITY
SITE SELECTION STUDY
THORNE BAY, ALASKA

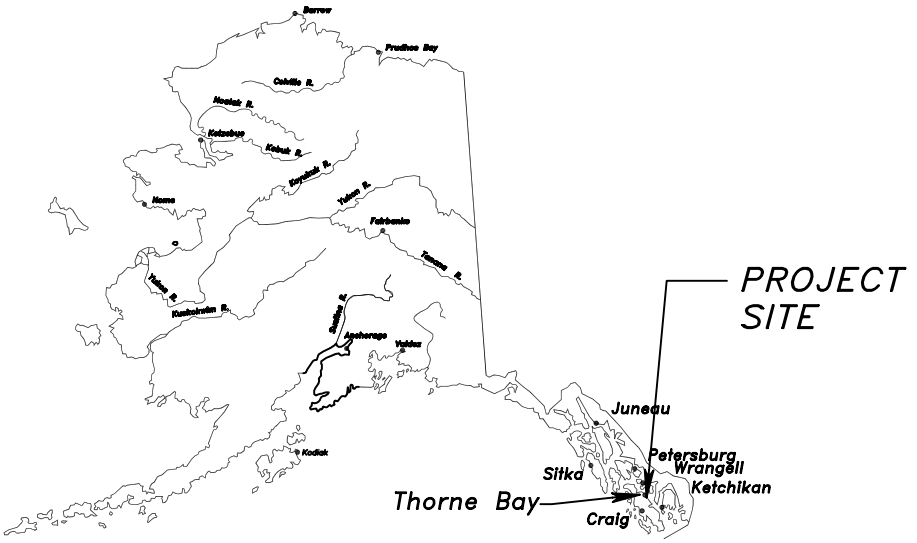
NOTE: MAPPING TAKEN FROM USGS QUAD CRAIG C-2

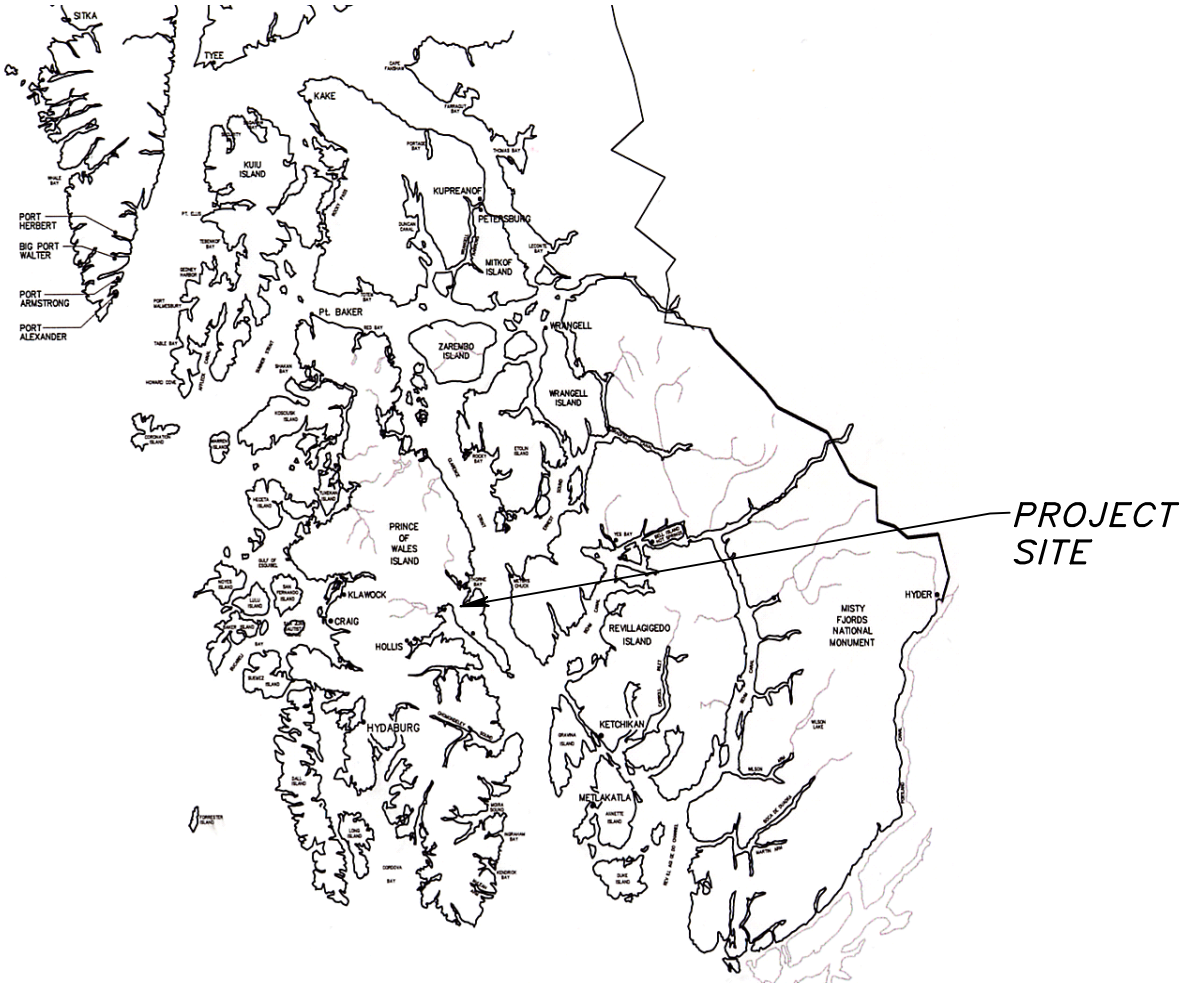
CLIENT: CITY OF THORNE BAY
PO BOX 19110
THORNE BAY, AK 99919

PROJECT NO.	SCALE:	DRAWN BY:	CHECKED BY:	DATE:	SHEET NO.
062319	1" = 1 Mile	J.R.M.	S.A.M.	5/25/07	–

R&M

GRAPHIC SCALE
SCALE IN MILES, APPROX.
0 400





SITE VICINITY MAPS
REGIONAL SOLID WASTE LANDFILL
SITE SELECTION STUDY
THORNE BAY, ALASKA

CLIENT: CITY OF THORNE BAY
PO BOX 19110
THORNE BAY, AK 99919

GRAPHIC SCALE
SCALE IN MILES
0 40 80

PROJECT NO.	SCALE:	DRAWN BY:	CHECKED BY:	DATE:	SHEET NO.
062319	AS NOTED	S.A.M.	S.A.M.	5/25/07	–

XI. References

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- *Decision Maker's Guide to Solid Waste Management – Vol. II*; Environmental Protection Agency (EPA 530-R-95-023). 1995. Project Co-Directors: Philip R. O'Leary, Patrick W. Walsh, Solid and Hazardous Waste Education Center, University of Wisconsin-Madison/Extension
- *Solid Waste Disposal Websites – Various*; U.S. Environmental Protection Agency
- *State of Alaska Solid Waste Regulations* 18 AAC 60; As Amended Through August 8, 2003
- *Environmental Atlas of Alaska*; University of Alaska, Institute of Water Resources, Engineering Experiment Station; Charles W. Hartman, Philip R. Johnson; 1984
- *2003 International Building Code*; International Code Council; 2004
- *Municipal Solid Waste Disposal Alternatives, Southeast Alaska: Developing Regional Solutions*; March 7, 2007 Draft; Smith Bayliss LeResche, Inc., Environmental Consultants and Engineers; Funded by U.S. Department of Agriculture-Rural Development
- *Prince of Wales Island Area Plan*; Prepared by: Alaska Department of Natural Resources, Division of Mining Land and Water, Resource Assessment and Development Section; Revised October, 1998

XII. POINTS OF CONTACT

- Mr. Jerry Bartlett – Vice President, Cedar Grove Composting, Everett, WA
- Mr. Damon Taam – Director, Spokane Regional Solid Waste System, Spokane, WA
- Mr. Bob Sivertsen – Supervisor – City of Ketchikan Solid Waste Handling and Recycling Facility, Ketchikan, AK
- Mr. Ed Emswiler – Solid Waste Program, Alaska Department of Environmental Conservation, Juneau, AK
- Mr. Ted Deats – Lands Division, Alaska Department of Natural Resources, Juneau, AK

- Mr. John Dunker – Water Resource Manager, Southeast Region, Water Resources Section, Division of Mining, Land and Water, Alaska Department of Natural Resources, Juneau, AK
- Mr. Doug Campbell – Alaska Mental Health Lands Trust Office, Anchorage, AK
- Mr. Matt Henry – Manager, Roosevelt Regional Landfill, Roosevelt, WA
- Mr. Greg Mickelson – Alaska Power and Telephone, Klawock, AK
- Mrs. Patti Krosse – Soils Scientist, USDA Forest Service, Ketchikan, AK
- Mr. Malcolm Menzies, Southeast Director, Alaska Dept. of Transportation and Public Facilities